UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/976,621	10/12/2001	Bernhard Erich Hermann Claus	RD-28415	1672

41838 7590 11/28/2006

GENERAL ELECTRIC COMPANY (PCPI)
C/O FLETCHER YODER
P. O. BOX 692289
HOUSTON, TX 77269-2289

EXAMINER	
CHEN, WENPENG	

ART UNIT	PAPER NUMBER
2624	

DATE MAILED: 11/28/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

MAILED
NOV 28 2006
Technology Center 2600

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/976,621
Filing Date: October 12, 2001
Appellant(s): CLAUS ET AL.

Patrick S. Yoder
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 9/14/2006 appealing from the Office action mailed 11/28/2005.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6,081,577	WEBBER	6-2000
6,744,848	STANTON ET AL.	6-2004
6,028,910	KIRCHNER ET AL.	2-2000

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-3, 13, 14-16, and 26 are rejected under 35 U.S.C. 102(b) as being anticipated by Webber (US patent 6,081,577.)

For Claims 1-3, Webber teaches a method for reconstructing a three-dimensional dataset representative of an imaged object (abstract; column 4, lines 17-31), said method comprising:

-- acquiring views of an object from at least two projection angles with an imaging system including at least one radiation source and at least one detector array to generate a projection dataset of the object; (Figs. 1 and 24B; column 13, lines 44-51; column 14, lines 58-64; column 22, line 9 to column 23, line 19; Element 27 can be an x-ray source. Recording medium can be a CCD that is the detector array.)

-- backprojecting the views across an imaged volume to generate backprojected data; (Figs. 2,3, and 24B; column 22, line 9 to column 23, line 19)

-- processing the backprojected data using a non-linear operator to generate a three-dimensional dataset consisting of a plurality of images representative of the imaged object; (Figs. 2,3, and 24B; column 22, line 9 to column 23, line 19; Both Figs. 24A and 24 B teach backprojection.)

-- wherein acquiring views of an object from at least two projection angles with an imaging system comprises acquiring views of an object with one of a computed tomography (CT) detector array, a mammographic detector array, and a chest detector array; (column 22, lines 49-64; column 27, line 54 to column 28, line 13; column 28, lines 32-40)

-- wherein processing the backprojected data using a non-linear operator comprises projections yielding maximum are selected. (column 23, lines 10-19)

For Claim 13, Webber teaches a method for reconstructing a three-dimensional dataset representative of an imaged object (abstract; column 4, lines 17-31), said method comprising:

-- acquiring views of an object from at least two projection angles with a medical imaging system including at least one radiation source and at least one detector array to generate projection data of the object, wherein said at least one detector array comprises one of a computed tomography (CT) detector array, a chest detector array and a mammographic detector array; (Figs. 1 and 24B; column 13, lines 44-51; column 14, lines 58-64; column 22, line 9 to column 23, line 19; column 22, lines 49-64; column 27, line 54 to column 28, line 13; column 28, lines 32-40; Element 27 can be an x-ray source. Recording medium can be a CCD that is the detector array.)

-- backprojecting the views across an imaged volume; (Figs. 2,3, and 24B; column 22, line 9 to column 23, line 19)

-- processing the backprojected data using a non-linear operator to generate a three-dimensional dataset consisting of a plurality of medical images representative of the imaged object; (Figs. 2,3, and 24B; column 22, line 9 to column 23, line 19; Both Figs. 24A and 24 B teach backprojection.)

-- wherein said non-linear operator comprises **one** of a maximum operator, a minimum operator, a generalized average operator, a binary operator, a monotonic operator, a median operator and a generalized median operator according to the equations recited in Claim 13. (column 23, lines 10-19; Fig. 23; column 23, line 20 to column 24, line 17)

For Claims 14-16, Webber teaches a medical imaging system for reconstructing a three-dimensional dataset representative of an imaged object (abstract; column 4, lines 17-31), said medical imaging system comprising:

-- a detector array; (element 31 of Fig. 1)

-- at least one radiation source; (element 27 of Fig. 1)

-- a computer coupled to said detector array and radiation source (column 16, lines 1-6; Webber teaches that each step shown in Fig. 2 can be performed as part of a computer-executed process. Inherently, a computer is coupled to the source at least at step 49 of Fig. 2, to the detector array at step 51 of Fig. 2.) and configured to:

-acquire views of an object from at least two projection angles to generate projection data of the object; (Figs. 1 and 24B; column 13, lines 44-51; column 14, lines 58-64; column 22, line 9 to column 23, line 19; Element 27 can be an x-ray source. Recording medium can be a CCD that is the detector array.)

- backproject the views across an imaged volume; (Figs. 2,3, and 24B; column 22, line 9 to column 23, line 19)

- process the backprojected data using a non-linear operator to generate a three-dimensional dataset consisting of a plurality of medical images representative of the imaged object; (Figs. 2,3, and 24B; column 22, line 9 to column 23, line 19; Both Figs. 24A and 24 B teach backprojection.)

-- wherein said detector array comprises at least one of a computed tomography (CT) detector array, a chest detector array, and a mammographic detector array; (column 22, lines 49-64; column 27, line 54 to column 28, line 13; column 28, lines 32-40)

-- wherein to process the backprojected data using a non-linear operator, said computer further configured to process the backprojected data using a maximum operator. (column 23, lines 10-19; The computer is configured to perform at least steps 60-92 that including the backprojection process.)

For Claim 26, Webber teaches a medical imaging system for reconstructing a three-dimensional dataset representative of an imaged object (abstract; column 4, lines 17-31), said medical imaging system comprising:

-- a detector array, said detector array comprising at least one of a computed tomography (CT) detector array, a chest detector array, and a mammographic detector array; (element 31 of Fig. 1; column 22, lines 49-64; column 27, line 54 to column 28, line 13; column 28, lines 32-40)

-- at least one radiation source; (element 27 of Fig. 1)

-- a computer coupled to said detector array and radiation source (column 16, lines 1-6; Webber teaches that each step shown in Fig. 2 can be performed as part of a computer-executed process. Inherently, a computer is coupled to the source at least at step 49 of Fig. 2, to the detector array at step 51 of Fig. 2.) and configured to:

-- acquire views of an object from at least two projection angles to generate projection data of the object; (Figs. 1 and 24B; column 13, lines 44-51; column 14, lines 58-64; column 22, line 9 to column 23, line 19; Element 27 can be an x-ray source. Recording medium can be a CCD that is the detector array.)

-- backproject the views across the imaged volume; (Figs. 2,3, and 24B; column 22, line 9 to column 23, line 19)

-- process the backprojected data using a non-linear operator to generate a three-dimensional dataset consisting of a plurality of medical images representative of the imaged object, wherein said non-linear operator comprises one of a maximum operator, a minimum operator, a generalized average operator, a binary operator, a monotonic operator, a median operator recited in Claim 26, and a generalized median operator recited in Claim 26. (Figs. 2,3, 23, and 24B; column 22, line 9 to column 23, line 19; column 23, line 20 to column 24, line 17; Both Figs. 24A and 24 B teach backprojection. The computer is configured to perform at least steps 60-92 that including the backprojection process.)

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 27-29 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Webber (US patent 6,081,577) as applied to Claims 1-3 and 13 as discussed above, and further in view of Stanton et al. (Us patent 6,744,848.)

Webber, as discussed above, teaches the corresponding method claims 1-3 and 13 of Claims 27-29 and 39. However, Webber does not explicitly teach a computer readable medium as recited in the claims.

Stanton teaches a computer readable medium and a computer program for controlling a 3D imaging system. (column 7, lines 41-65; column 12, lines 54-64; memory 56 of Fig. 3)

It is desirable to make a processing method portable from a computer to another computer. It would have been obvious to one of ordinary skill in the art, at the time of the invention, to store the processing steps of the method taught by Webber in a computer readable medium taught by Stanton, because the combination makes the processing method portable and therefore increase its application.

(10) Response to Argument

1. ***Overview*** of the teachings of Webber (US patent 6,081,577) relevant to the claims.

Because the key issue of disagreement in this appeal is the feature of "the backprojected data to be processed using a non-linear operator", the Examiner will focus on explaining how Webber teach this feature.

Webber teaches a first embodiment of synthesizing an image of a 3D object in Figs. 1-3. A 3D image is generated by integrating images of multiple slices of the object (step 94 of Fig. 2). As shown in Fig. 1, a radiation 27 passes through the object 21 and thus passes through each slice of the object. The radiation is attenuated by absorption or scattering at each slice and finally reaches recording medium 31 with its final intensity to be recorded there. The detected intensity at a detecting element represents the end intensity of a radiation beam projected through the object along a line defined by source 27 and the pixel positions. The collection of the detected intensity of all detecting elements at medium 31 forms a projected image. Because the detected intensity at the

detecting element is related to multiple slices, an image producing with source 27 at a location contains information of all slices. An image generated by the source at only one position alone cannot be used for determining an image of a particular slice. Therefore, a plurality of projected images are needed as stated in column 7, line 28-32. In the first embodiment, markers are used for reference points so the relative position of the object 21, source 27, and recording medium 31 can be determined with any arrangement among them. Using markers is not an issue here. Figs. 1-3 provide the generic teachings for Figs. 23-24 to be discussed below.

Webber teaches another embodiment for generating tomosynthetic images optimized for specific diagnostic task as shown in Figs. 23-24. In Fig. 23, projected images are generated (box 902) as discussed above. **The projected images are then laterally shifted to position required to produce desired slice (box 904). The process performed in box 904 is a backprojection process** and will be explained in details later. **The shifted (backprojected) projected images (backprojected data) are then under three different operations (boxes 908, 912, and 918) selectively based on the backprojected data. Among the three different operations, two are non-linear operators: processes in boxes 908 and 912.** The resultant slice is then displayed. A 3D image is generated by integrating images of multiple slices of the object (step 94 of Fig. 2) generated this way.

2. Responses to Appellants' argument

(a) With regard to **<u>Ground of Rejection No. 1: Claims 1, 13, 14 and 26 and the Claims Depending Therefrom.</u>**

Applicants' argument -- Appellants' position with respect to the Webber reference can be summarized as follows. Independent claims 1, 13, 14 and 26 recite, in generally similar language, *acquiring views of an object from at least two projection angles to generate projection data of the object, backprojecting the views across an imaged volume to generate backprojected data, and processing the backprojected data using a non-linear operator to generate a three-dimensional dataset consisting of a plurality of images representative of the imaged object.* All the claims require ***the backprojected data to be processed using a non-linear operator.***

Webber discloses using a non-linear operator *but never in combination with backprojection operation.* In other words, Webber discloses using *either* backprojection (linear tomosynthesis) *or* minimization (non-linear tomosynthesis) *but not both.* Appellants respectfully assert that *there is no teaching or suggestion that the backprojected data are being further processed via a non-linear operator as claimed in the present application.* In fact, Webber teaches that one skilled in the art may not need a backprojection technique at all and may just rely on the non-linear combination of the projection images to generate a tomosynthesis image for diagnosis.

Examiner's response -- The Examiner disagrees with the above conclusions. It seems to the Examiner that there is a need of clarification of meaning of "backprojection". For the clarification, the Examiner likes to refer to Kirchner et al (US 6,028,910) to provide a clearer example of backprojection.

What is a backprojection? In Fig. 5b and column 9, lines 9-49, Kirchner explains how the data at points A-E detected by a detector 14 are backprojected to corresponding points A'-E' at a PP plane of a slice in an object for 4 views. **First, radiation 10 is projected to position A-E on detector 14 shown in Fig. 5a in the direction from 10 to A-E.** Backprojection is performed with finding the intersected

point of PP plane and lines connected the source point 10 and points A-E at detector 14. **Intensities at A-E are then assigned to A'-E' at PP plane in Fig. 5b. For example, intensity is mapped to C' in the reverse direction of projecting point 10 to point C (backprojection of projection from point 10 to point C).** Point C' is defined at the intersection of PP plane and a line connected the source point 10 and point C. C is thus shifted in its position relative to the source point. Evidently, the shifts depend on the location of a selected slice. The top drawing of Fig. 5c shows the relative positions of the backprojected data of A-E for four views. The data of the backprojected data at four views are then superimposed to form a final data shown in the bottom of Fig. 5c. Evidently, the data are backprojected first and the operation such as superposition is performed.

Webber teaches in column 23, lines 25-31 that "at step 904, the projected images are shifted laterally, in the plane of projection, **by amounts required to produce a desired tomosynthetic slice** where all the images are then superimposed, in a manner identical to the method described in connection with steps 60 and 65 of FIG. 2". An example of the shifted data is shown in Fig. 24 of Webber. Data generated at two angles of view (1146 and 1148) are first shifted in position **by amounts required to produce a desired tomosynthetic slice as shown in the drawing element below the drawings of 1146 and 1148**. For example, pixels B and E are shifted to the same location. Webber teaches clearly in Fig. 23 and column 23, line 20 to column 24, line 17 that the backprojected data corresponding to a desired slice is then processed according to (1) nonlinear operations in step 908 or 912 (which corresponds Fig. 24B) or (2) conventional linear tomosysthesis at step 918 according to feature property.

As explained above, Webber indeed teaches *that the backprojected data (results of step 904 in Fig. 23) are being further processed via a non-linear operator (step 908 or 912 of Fig. 23) as claimed in the present application.*

(b) With regard to **Ground of Rejection No. 2: Claims 27 and 39 and the Claims Depending Therefrom.**

Applicants' argument -- The Examiner failed to apply combinations of references that include *all of* the recited features of claims 27 and 39. Independent claims 27 and 39 include similar recitations as claims 1, 13, 14 and 26 and require *the backprojected data to be processed using a non-linear operator.* At least because Webber, as discussed above, fails to teach or suggest processing the backprojected data using a non-linear operator, and as none of the remaining references were argued to do so,

Examiner's response -- The Examiner disagrees with the above conclusions. As responded above in section (10)2(a), the Examiner pointed out how Webber teaches the feature of "processing the backprojected data using a non-linear operator".

(11) Related Proceeding(s) Appendix

Copies of the court or Board decision(s) identified in the Related Appeals and Interferences section of this examiner's answer are provided herein.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Wenpeng Chen

11/20/06

Conferees:

Matthew Bella

Jingge Wu

MATTHEW C. BELLA
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600

JINGGE WU
PRIMARY EXAMINER